

List of exercises 3

The file LFPprobe.mat contains simultaneous recordings of 16 LFP channels from a NeuroNexus vertical linear probe, with electrodes ranging from the parietal cortex to the hippocampus, spaced by 100 μ m (contact surface: 703 μ m²).

Write a script to execute – on different blocks of code – the following:

- 1) Plot all channels simultaneously (without overlapping)
- 2) Vary the plotted epoch above using sliding windows of 2 s (“LFPtv”)
- 3) Compute the PSD of each channel, using both absolute and normalized (% power) values
- 4) Plot four panels on different subplots, where each panel shows the PSDs of all channels in the following variations: [absolute x normalized] X [linear x logarithmic scale]
- 5) Compute the average power (absolute and normalized) on the theta frequency range (5-10 Hz) for each channel
- 6) Create a line plot of the values obtained in 5), indicating the spatial location (‘height’) of the electrode (from 100 to 1600 μ m) on the Y axis and average power on the X axis. Do one figure for absolute values and another for normalized ones.
- 7) Repeat 5) and 6) for gamma (30 to 100 Hz) and HFO (120 to 160 Hz) frequency bands
- 8) Compute and plot the TFD (spectrogram) for channels 1 and 16 in different subplots
- 9) Use the result from 8) to compute and plot the time series of average power in theta, gamma and HFO on both channels (show each frequency band in a different subplot)
- 10) Plot, in different subplots, scatterplots of every possible combination of the time series in 9) (e.x., theta ch 1 vs theta ch 16, theta ch 1 vs gamma ch 16, etc), using their linear correlation value as the title of each subplot
- 11) Compute and plot the coherence spectrum of channels 2 and 16 with channel 1, separately
- 12) Compute the average coherence on theta and gamma for the same channel pairs in 11)
- 13) Create a line plot of the values obtained in 12), indicating the spatial location (‘height’) of the electrode (from 100 to 1600 μ m) on the Y axis and average coherence values on the X axis.
- 14) Compute and plot the coherogram between channels 1 and 16
- 15) Compute and plot (using imagesc) the average coherence in a given frequency band (e.x., theta or gamma) for every possible pair of channels.